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Predictive Validity and Reliability of the Navy Vocational Interest Inventory: Job Opportunities in the Navy (JOIN)

Hubert T. Chen, M.A., M.S.
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Reviewed and Approved by
Jacqueline A. Mottern, Ph.D.
Institute for Selection and Classification

Released by
David L. Alderton, Ph.D.
Director

Navy Personnel Research, Studies, and Technology (NPRST/BUPERS-1)
Bureau of Naval Personnel
5720 Integrity Drive
Millington, TN 38055-1000
www.nprst.navy.mil

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14. ABSTRACT

This study examined the validity and reliability of the Navy vocational interest inventory, Jobs Opportunities in the Navy (JOIN). A positive relationship between interest and satisfaction was hypothesized. The reliability of JOIN was examined as a whole, and further compared among gender and racial subgroups to ensure that the outcomes of JOIN were free from differential reliability among the subgroups. Data from a usability survey were analyzed to examine face validity of the instrument. Results showed that JOIN was positively correlated with training satisfaction. Furthermore, the instrument produced highly reliable results as a whole and among subgroups. Lastly, statistical analyses suggested that JOIN was face valid and held the attention of participants well. Future data collection and analyses were recommended to further support the outcomes of this study.

15. SUBJECT TERMS

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Foreword

In December 1998, Navy Personnel Research Studies and Technology (NPRST) proposed a comprehensive research plan to better attract, employ, and retain 21st century personnel. Dubbed *Sailor 21,* the program's overarching goal was to develop a series of models and tools that had the adaptive capability, predictability, and flexibility to map a multivariate predictor space (i.e., tests, personality, personal history, and interest) onto a multivariate performance space (NPRST, 1998). This agenda proposed a new generation of selection and classification processes and techniques that provide a capability to evaluate individual sailor traits across the entire personality spectrum, ultimately leading to a definable and quantifiable assessment of the individual--*Whole Person Assessment (WPA)*. To develop an individual vocational interest tool as part of WPA, researchers at NPRST undertook development of Job Opportunities in the Navy (JOIN) (formerly known as Jobs and Occupational Interests in the Navy). This work was designed to investigate potential recruits' vocational interests among Navy enlisted ratings. This report marks an intermediate step in producing a comprehensive Navy job (rating) interest tool, one that affords Navy applicants a higher degree of insight into the Navy's world of work and offers increased understanding of Navy jobs.

David L. Alderton, Ph.D.
Director

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Introduction

Sailor 21

In December 1998, Navy Personnel Research Studies and Technology (NPRST) proposed a comprehensive research plan to better attract, employ, and retain 21st century personnel. Dubbed *Sailor 21,* the program's overarching goal was to develop a series of models and tools that had the adaptive capability, predictability, and flexibility to map a multivariate predictor space (i.e., tests, personality, personal history, and interest) onto a multivariate performance space (NPRST, 1998). This agenda proposed a new generation of selection and classification processes and techniques that provide a capability to evaluate individual Sailor traits across the entire personality spectrum, ultimately leading to a definable and quantifiable assessment of the individual. A multi-dimensional classification technique, *Whole Person Assessment (WPA)* includes capabilities to measure potential recruits' (a) testing achievement, (b) complex reasoning, (c) spatial ability, (d) job specific skills, (e) interests, (f) social understanding, (g) conscientiousness, (h) motivation, (i) leadership, and (j) emotional stability. WPA and its subcomponents optimally match prospective Sailors with available enlisted ratings (jobs), further increasing the likelihood of a more congruent fit in the selection and classification process (NPRST, 1998).

To develop an individual vocational interest tool as part of WPA, researchers at NPRST undertook the development of Job Opportunities in the Navy (JOIN) (formerly known as Jobs and Occupational Interests in the Navy). This work was designed to investigate potential recruits' vocational interests among Navy enlisted ratings. By using personality constructs bound up in person-environment (P-E) fit, person-organization (P-O) fit, person-job (P-J) fit, and vocational interest, JOIN potentially increases Sailors' job satisfaction (Klein & Wiener, 1977; Worthington & Dolliver, 1977; Rounds, Dawis, & Lofquist, 1987; O'Reilly, Chatman, & Caldwell, 1991; Cronbach, 1984), work performance (Hogan & Blake, 1996), organizational commitment (O'Reilly et al., 1991; Chatman, 1991), intrinsic motivation (Eisenberger, Pierce, & Cameron, 1999; Deci, Koestner, & Ryan, 1999), leading to reduced attrition (Saks & Ashforth, 1997).

Theories of Person-Environment Fit

The purpose of implementing any vocational interest measure within an organization's recruitment, selection, and classification system is to enhance the fit between individuals and the work environment (i.e., Person-Environment fit; also known as P-E fit). The theory of P-E fit suggests that individual attitudes and behaviors result from collaboration between persons and the environment (Edwards, 1996). By enhancing P-E fit between individuals and work environments, benefits such as job satisfaction (Klein & Wiener, 1977; Worthington & Dolliver, 1977; Rounds et al., 1987; O'Reilly et al., 1991; Cronbach, 1984), organizational commitment (O'Reilly et al., 1991; Chatman, 1991), job performance (Hogan & Blake, 1996), and intrinsic motivation (Eisenberger et al., 1999; Deci et al., 1999) may be derived. Factors such as turnover are

reduced by enhancing the P-E fit between an individual and his/her work environment (Saks & Ashforth, 1997). It is this last issue of excessive turnover (attrition) that is of particular concern to the U.S. Navy.

There are a number of different types of P-E Fit: Person-Organization Fit (P-O Fit) assesses the antecedents and consequences of compatibility between people and the organizations in which (a) at least one of the entities provides what the other needs, (b) both share similar fundamental characteristics, or (c) both a and b (Kristof, 1996). Person-Job fit (P-J Fit) emphasizes the compatibility, contingency, or joint influence of the person and job for predicting individual and organizational outcomes (Edwards, 1991). It focuses on the correspondence between individual desires and the target jobs.

Throughout the academic literature, studies have demonstrated the benefits of considering P-J fit; research has shown that perceptions of P-J fit are positively correlated with higher job satisfaction, organizational commitment, and organizational identification and negatively correlated with stress symptoms and intentions to quit (Saks & Ashforth, 1997). Furthermore, the theory of decision confirmation suggests that when a job choice experience is positive, individuals emphasize information that leads to positive work attitudes, whereas information that fosters negative work attitudes is discounted or ignored. This phenomenon occurs because individuals actively seek to confirm positive decisions (Power & Aldag, 1985).

One of the most commonly studied topics in this arena involves the impact of P-E fit on job satisfaction. Research has shown that high vocational interest congruence is highly correlated with job tenure and job satisfaction (Klein & Wiener, 1977). Worthington and Dolliver (1977) support the hypothesis that higher congruence between individuals' interests and their jobs (person-job congruence), the more likely these individuals are to rate themselves as satisfied with their jobs. Rounds et al. (1987) showed that P-E congruence explains 3–30 percent of the variance in job satisfaction.

Other benefits of matching individuals with organizations (P-O fit) have been supported by the following studies. Saks and Ashforth (1997) suggest that perceptions of P-O fit are negatively related with intentions to quit and turnover. O'Reilly et al. (1991) demonstrated that higher P-O fit is positively correlated with organizational commitment ($r = .25$, $p = .01$), and negatively correlated with *Intent to Leave* ($r = -.37$, $p = .01$). Furthermore, they reported that the measure of P-O fit is positively correlated with job satisfaction ($r = .35$, $p < .01$).

In recent literature on intrinsic motivation, General Interest Theory (GIT) proposes that the content and context of tasks that an individual performs may increase intrinsic motivation when these specific tasks help satisfy needs, wants, or desires (Eisenberger et al., 1999; Deci et al., 1999). Therefore, GIT suggests that intrinsic work motivation may be enhanced by maximizing the fit between individuals and tasks within a job. In other words, enhancing P-J fit may generate greater intrinsic motivation among workers.

Vocational Interests

According to Savickas and Spokane (1999), E. K. Strong documented his work on the measurement of vocational interests some 80 years ago. His research attempted to answer questions such as: What are interests? What role do they play in human affairs? Can one's behavior be predicted if the individual's interests are known? To this day, many aspects of Strong's interest theory are empirically supported, and some are hypotheses waiting to be investigated by future researchers. The following summarizes the current views concerning the concept of vocational interests.

Perhaps one of the most cited definitions of vocational interest comes from Strong's work in 1943 in which he defined vocational interests as job related activities for which we have liking or disliking, are attracted to or repelled by, or which we continue or discontinue from status quo; furthermore, they may or may not be preferred to other interests and may continue over varying intervals of time (Strong, 1943). Thus, vocational interests are individual preferences (liking or disliking) among stimuli (in this case, different types of jobs) that lead to the likelihood of an individual to engage in certain activities. In other words, most behaviors are the result of individual preferences for engaging in specific activities, and people tend to go toward liked activities and away from disliked activities (Dawis, 1991). Some other theorists view interests as the interaction between the individuals and their surrounding environment. In this sense, interests are the collection of individuals' experiences in terms of objects and activities that yield individual tendencies to seek personal satisfactions (Savickas, 1999).

One of the major assumptions underlying the relevant research literature is that interests are learned. According to Savickas (1999), interests derive from the interaction between individual abilities and reinforcement values—reinforcement value "denotes a person's generalized requirement for reinforcers and preference for stimulus conditions that in the past have been reinforcing" (Savickas, 1999). On the other hand, abilities relate to the individual's success with engaging in a certain activity (Dawis, 1991). Thus, positive experiences reinforce interests in a certain area, whereas negative experiences can lead to the rejection of that particular field. In summary, the origin of vocational interests is the combination of the individual's capacity to have executed activities in the past and the value of the current reinforcer (Savickas, 1999).

Stability of Interests

The issue of stability of interests was succinctly described by Fryer (1931) in *The Measurement of Interests in Relation to Human Adjustment*:

> To hold that human interests are stable, that interests are permanent, necessarily denies any great amount of variability in the life of the individual. But, on the other hand, to hold that interests are unstable, absolutely lacking in permanence, denies any possibility of the genetic development of interests, of the formation of habits of being interested. (pp. 143-144)

Because interests are the synthesis of past experiences and individual abilities, and both of these components are subject to new stimuli that generate learning behaviors, the stability of interests is subject to change over time. Some research shows, however, that interests are remarkably stable over long periods. For example, Swanson and Hansen (1988) investigated the longitudinal stability of vocational interests in a sample of 409 college freshmen by using the Strong-Campbell Interest Inventory (SCII). Their findings suggest that interest stability remained fairly consistent over time, with mean stability coefficients of .78, .78, and .70 in the female samples and .76, .81, and .70 in the male samples for 4-year, 8-year, and 12-year intervals, respectively. Cronbach (1984) also reported that, for adolescents who are not bound for college, interests appear to stabilize comparatively early. Furthermore, the stability of individuals' interests after the age of 20 stayed relatively consistent over a 3-year interval, with test-retest coefficients of 0.75, 0.70, and 0.70 for participants in the profession of biologist, author-journalist, and office worker, respectively (Cronbach, 1984). Johansson and Campbell (1971) summarized Strong Vocational Interest Blank (SVIB) data and found that test-retest correlation coefficients ranged from 0.54 to 0.84 over the intervals of 1 to 23 years.

Despite these findings, some research suggests that individual interests can undergo substantial change over time (Swanson, 1999). Furthermore, it seems that there are a number of variables related to these changes. Swanson (1999) suggested several hypotheses regarding factors that may affect interest stability. For example, stability appears to increase with age; at younger ages, interest change should be considered as an index of career development rather than instability. Furthermore, sex-typical interests seem to be more stable due to societal support. Thus, stability may be higher for males who report mechanical or scientific interests, and for females who report artistic interests (Stein, Newcomb, & Bentler, 1986). Next, robust interests may tend to remain more stable than the "lukewarm" or indifferent interests. Interest instability may also be associated with career decisions one would have to face, where a change in career can lead to the willingness to consider other alternative interest areas (Swanson, 1999).

In summary, future studies concerning the assessment of interest should address the issue of stability. For example, it is necessary to assess the stability of interest to determine whether the interests of Navy Sailors would change throughout their careers. Furthermore, analyses on how the changes of interest over time may affect Sailors' organizational commitment, performance, work satisfaction, turnover, and intrinsic motivation should also be included in future studies to explore the utility of Job Opportunities in the Navy (JOIN) beyond the first-term of enlistment. Therefore, future longitudinal data collection efforts will be crucial for the long-term assessment of JOIN.

Overview of Navy Recruiting, Selection, and Classification Procedures

Each year, the U.S. Navy must select and classify 37,000–40,000 new Sailors to fill its manpower needs (Commander, Navy Recruiting Command statistics, n.d.). But today, Navy Recruiting does not consider any sort of formal vocational interest measure as part of this process. What information is known is obtained informally through one-on-one interviews between applicants, enlisted classifiers, and recruiters. Of principal

concern here is to what extent this informal approach influences downstream retention. In order to capture the nuances of this sometimes complicated process, a brief overview is required.

The selection and classification process is two-phased and two Navy actors are key to leading applicants through this process—the Navy recruiter and the enlisted classifier. First among these is the recruiter. Recruiters are Sailors assigned to duty with the Navy's Recruiting Command who make initial contact with prospective applicants, establish rapport, conduct preliminary interviews, and perform rudimentary screening. During initial screening recruiters inquire into individuals' backgrounds on topics such as citizenship, education attainment, police involvement, medical conditions, etc. Additionally, recruiters administer an Enlistment Screening Test (EST), a scaled down version of the Armed Forces Qualification Test (AFQT), which is designed to assess verbal and mathematical skills. Administration of the EST provides an initial assessment of applicants' intellectual ability and it functions as a pre-screening tool to help recruiters determine whether individuals meet minimum mental ability requirements for entry. Those who successfully complete the EST and are otherwise eligible for military service next receive full cognitive skill testing with the Armed Services Vocational Aptitude Battery (ASVAB). The AFQT portion of the test uses a series of cognitive ability tests to determine selection eligibility; whereas, ASVAB composites are used principally for job classification purposes. The ASVAB and its AFQT component comprise nine distinct subtests: Word Knowledge (WK), Paragraph Comprehension (PC), Arithmetic Reasoning (AR), Mathematics Knowledge (MK), General Science (GS), Auto and Shop Information (AS), Mechanical Comprehension (MC), Electronics Information (EI) and Assembling Objects (AO). Upon completion of basic eligibility screening and ASVAB testing, applicants proceed to the second phase of processing.

Phase two of the recruitment process takes place at a Department of Defense (DoD) sponsored and U.S. Army operated activity--the Military Entrance Processing Station (MEPS). At MEPS, candidates for enlistment are given a thorough physical examination, undergo in-depth background investigation, and may receive specialized testing. Those who successfully complete all of the Navy's entry requirements are then given the opportunity to meet and discuss job options with a job counselor or enlisted classifier in Navy vernacular. During this brief counseling session, a list of available jobs as determined by ASVAB scores and job vacancies is presented to the candidate. Potential recruits are provided with a short one-page description of the job, the type of work, and a brief description of where that work may be performed. The applicant is given an opportunity to ask questions of the classifier about the work involved and discuss alternatives, bonus options, term of enlistment, etc. At the end of this session, individuals are asked to make a selection. It is during this process that enlisted classifiers, who operate under an assigned recruiting goal, often guide applicants towards vacancies that fit Navy needs, but give little consideration to applicant's preferences.

If the applicant successfully navigates all of the aforementioned obstacles, a contract is drafted with the specification of an individual work assignment (rating), term of enlistment, and any applicable bonuses that may be offered. At this point candidates proceed to a swearing-in ceremony and then typically return home to await their date of

departure (i.e., ship date). On rare occasions, individuals will proceed directly from swearing-in to awaiting transportation for the journey to Recruit Training Command Great Lakes, Illinois to begin basic training.

Problem of Attrition

During the years 1985–1995 Navy first-term attrition (defined as the proportion of enlistees who fail to complete their first contractual obligation) increased steadily from 30.6 percent to 39.6 percent (GAO, 2000). Approximately 13.6 percent of all enlistees were separated before they completed 6 months of service. Of those individuals, roughly 39.1 percent of all attrites in 1995 exited the Navy within 6 months of their initial enlistment. Furthermore, the estimated average cost of recruiting and training each enlistee rose from $19,143 in 1993 to $35,500 in 1998. Therefore, if the recent attrition rate persists, the cost to recruit and train new Navy Sailors will become even greater (GAO, 2000). Currently, the Navy lacks data concerning the causes for first-term attrition, but one possibility in light of other research is that it is caused by inappropriate job classifications.

Development of a Navy Vocational Interest Inventory

In an effort to improve the classification process and reduce attrition, the Navy undertook the development of a vocational interest inventory known as Job Opportunities in the Navy (JOIN). Designed to supplement information obtained from the ASVAB and recruiter interviews, JOIN measures vocational interests of Navy recruits vis-à-vis the various enlisted ratings. Derived from the theories of vocational interest, P-E, P-O, and P-J fit, it is a tool that directly addresses the increasing problem of attrition. JOIN is designed to be used in concert with the Rating Identification Engine (RIDE), an algorithm that uses individuals' ASVAB scores to generate a list of ratings for which individuals are qualified (the instrument does not display ratings that are not vacant). In other words, RIDE has the capability to receive inputs from JOIN and rank order the qualified ratings according to individuals' self-reported interests (dependent upon the availability of each rating). Overall, RIDE (with the capability to input rating preference data from JOIN) will be used by the Navy classifiers to distribute manpower among the wide array of Navy work (Farmer et al., 2007).

Development of the First JOIN Prototype (JOIN 1.0 Delta)

JOIN is a computerized interest inventory designed to assess recruits' vocational interests with respect to four domains of the Navy jobs (community area, work style, work environment, and work activity; see Appendix A). The instrument is structured to be a flexible inventory that evaluates recruits' preferences with respect to these domains. The initial idea was to use existing vocational interest inventories developed by the Armed Forces, private organizations, and other government agencies as resources for the JOIN item development. Instruments such as Vocational Interest Career Examination (VOICE), Army Vocational Interest Career Examination (AVOICE), Navy Vocational Interest Inventory (NVII), Vocational Preference Inventory (VPI), and many

others were used to help guide the development of JOIN (Farmer et al., 2007). By using the hierarchical model of work development (Schippmann, 1999), analyses among job families (e.g., aviation, construction, intelligence, etc.), work styles (e.g., mental, physical, etc.), work environments (e.g., indoor, outdoor, physical, mental, etc.), and work activities (analyze communications, direct aircraft, maintain documents, etc.) were conducted to guide the development of the survey items. Next, a project plan was created to list the steps for item development and assessment of validity and reliability. The overall concept was to construct an instrument that would discriminate across all entry-level ratings to increase P-J fit. Furthermore, JOIN is intended to serve as a tool to inform potential recruits of the Navy's world-of-work (hence P-O and P-E fit). Administration time and readability of items were also major concerns throughout the development of the instrument, due to the limited amount of time available at MEPS for JOIN administration and the diverse education level of recruits.

Due to the diverse education level of recruits (ranging from GED to college graduates), descriptions of items were written in a simple and clear manner. In addition, pictures were collected to complement each instrument item. Furthermore, because most recruits have little prior knowledge about the range of tasks among Navy ratings, a broad spectrum of each job activity was depicted by a brief behavioral descriptive with pictures to ensure that all aspects of job activities were included. Because each participant receives two types of stimuli (description and pictures), the inclusion of both pictures and textual description helps to minimize biased responses due to the misrepresentation of items. In other words, the provision of pictures along with behavioral descriptions of each item assists the potential recruits with understanding the JOIN items.

Item Development

The first step in the item development was to compile all available job descriptions for the 79 entry-level enlisted ratings from sources such as the U.S. Navy homepage, Navy Manpower and Personnel homepage, Job Information Cards, and Enlisted Community Managers (ECMs). These descriptions were extracted to create preliminary survey items that represent each entry-level rating among the four different domains: community area, work style, work environment, and work activity. With regard to work activity, facets within the domain were divided into two separate components: (1) work process (e.g., to analyze, maintain, operate, etc.) and (2) work content (documents, mechanical equipments, weapons, etc.). The primary purpose of separating the facets within the work activity domain into two components was to create a logical structure among the overall job activities within the Navy, as well as to produce a smaller number of work activity items. Furthermore, the revision of survey items can be more effortless because the work activity items (i.e., Process-Content pairs; P-C pairs) can be easily added or deleted. The main objective of the P-C pairs is to discriminate aspects of the Navy enlisted job activities from one another (Watson, Michael, Hindelang, Farmer, & Alderton, 2006; see Appendix A of this report for a list of the P-C pairs).

Next, multiple feedback sessions were conducted with ECMs to review and revise the items. A number of ECMs within each community area participated in this Subject Matter Expert (SME) validation exercise. To ensure the resemblance of inventory items

to the realistic characteristics of each job, items were revised according to the suggestions provided by the SMEs. The task was to ask each ECM to indicate activities that were considered important to any specified ratings. For example, analyses showed that the essential work activities of an Electrician's Mate (EM) include analyze-documents, maintain-electrical equipment, maintain-mechanical equipment, operate-electrical equipment, and operate-mechanical equipment. The overall objective of this phase of research was to generate face validity of the instrument and further enable the individual to discriminate interests among different ratings. In other words, the JOIN 1.01e instrument items were postulated to resemble existing entry-level ratings. In this version of JOIN, the instrument consists of 7 community areas, 4 work styles, 4 work environments, and 26 work activities (See Appendix A for the list of JOIN facets within each domain).

Pictorial Item Development

After initial item formation, the next phase of instrument development consisted of the identification and selection of photographs that represent each of the survey items provided by numerous departments of the Navy (e.g., Navy Recruiting Command) and their Internet sources. These pictures serve as supplements to the descriptions for each work dimension. The general premise was to develop an interest inventory that goes beyond the textual descriptions of traditional interest inventories. Based on the assumption that most potential recruits have little knowledge of Navy entry-level ratings, these pictures represent realistic images of the Navy's community areas, work styles, work environments, and work activities. In addition, they also assist in the understanding of each item's textual description and hence minimize any biased responses related to partial exposure of the Navy's world-of-work from the media or other non-related sources. Because this type of exposure can provide only a portion of the Navy's world-of-work, three criteria were determined to guide the selection of images. These criteria specified that each set of pictures would need to (1) be representative of both routine and non-routine job tasks; (2) incorporate job-specific activities performed in all aspects of community area, work style, work environment, and work activities; and (3) display both gender and racial diversity (Watson et al., 2006). Approximately 500 pictures were collected to represent all facets within the job domains. Subsequently, these images were assessed by two groups of SMEs to validate the visual content of the collected images. The overall objective was to ask experts to categorize each picture in accordance to the predetermined domains and facets (see Appendix A), and also identify any dimension that was overlooked from previous item development. This validation effort resulted in more than 300 images within JOIN 1.01e, with three to four pictures representing each item (See Appendix B for examples of instrument items).

Software Development

Programmers affiliated with Electronic Data Systems (EDS) developed the JOIN software using Visual Basic. The effort resulted in the formation of the first prototype of the Navy computer-administered interest inventory, JOIN 1.0 Delta. The inventory consists of three components.

The first portion of the inventory consists of an item that asks respondents to rank order preferences among community areas (e.g., aviation, construction, submarine, etc). Second, questions were presented regarding each of the elements within work styles (e.g., work with teams, work independently, etc.) and work environments (e.g., indoor, outdoor, etc.). More specifically, participants were asked to rate each item on a graphic rating scale from 0 to 100 (higher numbers correspond with higher the interest). Third, three sets of work activity items (i.e., the work activity, Maintain-Weapons, has 3 items consisting of identical behavioral descriptions but different pictures) were administered to respondents randomly in accordance with the 26 work activities (e.g., Maintain-Documents, Operate-Weapons, etc.). The scale for these items was also from 0 to 100.

Initial Validation of the First JOIN Prototype (JOIN 1.0 Delta)

The first JOIN prototype (JOIN 1.0 Delta) was administered to 300 new Navy recruits during their third or fifth day after arriving at basic training. During this time, they were gathered by divisions (approximately 80–100 recruits) in an open-bay area for medical and dental in-processing (including dental and visual examinations, immunization, and sex education). Those individuals who were waiting to be called for processing or immediately following processing were asked to participate in pilot testing. This particular sample was hypothesized to have the closest match to future users of the instrument because the majority of recruits do not possess a great deal of knowledge regarding the world-of-work within the Navy. However, some response bias may have occurred because these recruits have already selected a rating. In other words, the knowledge acquired from recruitment may have generated response bias, even though this exposure may be minimal.

Results of the initial pilot testing suggest that the first prototype of JOIN (JOIN 1.0 Delta) is construct valid and internally reliable (Watson et al., 2006). In reference to the original model design of JOIN, the items should be able to discriminate among the different Navy enlisted ratings. To test this assertion, a principal component analysis was conducted on the work activities to ensure the items can distinguish and discriminate across the Navy enlisted ratings (construct validity). According to Watson et al. (2006), the analysis produced a 9-component solution that accounted for 89 percent of the variance among the Navy enlisted ratings (e.g., electronic, mechanical, administrative, mass communication, construction, intelligence, and weapons activities). In addition, the resultant factors seemed to correspond to the previously established occupational groups.

Descriptive analyses were performed to establish the overall distribution of participants' responses on each of the items. For community areas, approximately 33 percent of the respondents expressed the highest interest in the aviation community. About 18 percent of the respondents selected special programs to be their top choice. Health care and intelligence were the next highest responses, with 14 percent of respondents ranking these dimensions to be their preferred community.

Work style and work environment items were assessed in the same fashion. For work styles, most participants indicated a preference for working with a team and working with physical tasks. For work environments, outdoor activities showed the highest interest among respondents in comparison to indoor, office, and industrial environments.

Analyses concerning work activity items were also conducted. As mentioned above, three sets of individual items were developed for each work activity. Internal consistency of the item sets was assessed to ensure the items were measuring a single dimension. Analyses concerning the alpha reliability of the work activity items showed an average internal consistency of 0.895 among all work activity items. Moreover, the individual dimensions among each work activity indicated alpha levels ranging from 0.830 (Operate Mechanical Equipment) to 0.945 (Make Facilities), with the median between 0.898 (Maintain Security) and 0.905 (Train People).

During administration of the initial pilot test, a Usability Feedback Survey was given to assess different aspects of the first JOIN prototype. These exploratory Likert-scaled items consisted of: ease of use, clarity of instructions, readability of description, ratings of the tutorial, visual appeal, etc., which were designed to evaluate the face validity of JOIN (Watson et al., 2006). Descriptive analyses suggest that JOIN 1.0 Delta is easy to use and visually appealing. The instructions and tutorial ratings tended to be either good or very good. And most participants responded very positively when comparing JOIN to traditional paper-and-pencil questionnaires. However, a majority of participants indicated that JOIN 1.0 Delta does not hold users' attention very well. Feedback from open-ended questions suggests that the work activity items seem redundant due to the similarities among some of the work activity dimensions. For example, descriptions and images for items such as: maintain mechanical equipment, make mechanical equipment, and operate mechanical equipment were very similar to each other. Some participants were unable to make any distinctions among these items. Concerns have also been addressed from Navy classifiers to keep the administration time to approximately 15 minutes. Minimizing administration time is crucial to ensure that recruitment procedures at MEPS are not lengthened drastically from the current 3–4 hour process. Indications from this negative feedback suggest that a shorter version of JOIN might be more appropriate.

To address the problem of redundancy and administration time, a subsequent version was developed (JOIN 1.01e), which consists of two sets of work activity items (item-couplets) rather than three (item-triplets). There is a need to determine the psychometric properties of this new iteration. Specifically, comparisons among internal consistency of the work activity items between the JOIN 1.0 Delta (item-triplets) and JOIN 1.01e (item-couplets) need to be conducted to assess whether the reduction of items lowers the internal consistency of JOIN significantly.

Discussion groups were conducted to generate feedback from participants. In all, 11 discussion groups (57 recruits) were conducted throughout the 3-day data collection process. The results were very similar to responses from the Usability Feedback Survey; repetitive items should be eliminated to increase the ability of JOIN to hold participants' attention throughout the administration process.

Instrument Algorithm

After respondents answer all questions in JOIN, scores are automatically calculated using an internal algorithm. The algorithm of JOIN 1.01e uses test results and SME determined weightings in the calculation of individual interest fit scores (JOIN Fit) for each Navy enlisted rating. Beginning with the sum of squares among the products of participants' responses and the facet scoring weights within each domain ("Facet Scores"), computation of Euclidean distances among each "Facet Scores" result in a series of "Preference Data Scores" among the 79 Navy enlisted entry-level ratings. These "Preference Data Scores" are defined as: (1) functional category (i.e., community area), (2) environment preference (i.e., work style and work environment), and (3) process preference (i.e., work activity). Next, the "Preference Data Scores" are combined to produce a "JobRankValue." The smaller the "JobRankValue," the higher the Person-Job congruence. Each "JobRankValue" is converted into a JOIN Fit score. This procedure results in the establishment of JOIN Fit scores, for which the higher the value of JOIN Fit, the greater the individual interest fit to that specific rating. In other words, JOIN Fit represents the degree of congruence between interests of individuals and the 79 Navy enlisted ratings; each individual receives 79 JOIN Fit scores that represent the fit of Sailors to each rating. (See Appendix C for a detailed description of the JOIN Job Ranking Formula and Appendix D for an example calculation.)

Purpose

This study consists of three objectives: the first is to reevaluate the internal consistency among the work activity items (also known as Process-Content Pairs [P-C pairs] or item-couplets) to assess whether the reliabilities of the P-C items are sufficient after item reduction. More specifically, analyses of Cronbach's Alpha are conducted to assess whether the internal consistency of the work activity items are adequate to be applied to the Navy's workforce. Moreover, to ensure that JOIN does not produce different results among subgroups of individuals, comparisons of internal consistency among gender and race (BUPERS, n.d.) are investigated to determine whether JOIN 1.01e is more reliable for any specific subgroup.

Hypothesis 1: A reduction in the number of work activity items results in an internal consistency among the items of at least $\alpha = .70$.

At the time of data analysis, all participants had completed at least basic training. Some portion of the recruits may have also completed their job training (Apprentice School Training). Therefore, the second purpose of this study was to concurrently

validate JOIN 1.01e using data from the Navy First Watch program, which assesses self-reported training success and satisfaction of recruits at each of the initial milestones (i.e., basic training arrival, graduation, apprentice school graduation, and exiting the Navy force). The current study hypothesizes that JOIN 1.01e is significantly correlated with training success and satisfaction--that recruits are more satisfied and more likely to succeed in training when the fit between the individual and his or her rating is high.

Hypothesis 2: JOIN Fit scores generated from JOIN 1.01e correlate positively and significantly with training success and satisfaction.

Exploratory analyses are conducted to identify the changes for the next version of JOIN. Specifically, a modified version of the Usability Feedback Survey is administered throughout data collection to gather feedback from recruits. The expectation is that the reduction of work activity items (item- triplet approach reduced to the item-couplet approach) lessens the proportion of participants who perceive the items as repetitive.

Hypothesis 3: Lower number of participants perceive the work activity items of JOIN 1.01e as repetitive, in comparison to the findings from JOIN 1.0 Delta.

Method

Participants

Based on previous power analyses of Chi-square and multiple regression criterion validation methodologies, the calculation suggested that a large sample of 3,000–5,000 subjects was necessary to identify clear predictors for the instrument. As a result, JOIN 1.01e was administered to approximately 4,500 recruits during their first few days of basic training at Recruit Training Center (RTC), Great Lakes, IL. Random sampling was not feasible for this data collection effort due to the way in which recruits are processed. Therefore, a convenience sample is used throughout this study. Participants' social security numbers (SSNs) were collected in order to track these individuals for future longitudinal studies in criterion performance, once the data become available and analyzable.

Instrumentation

JOIN 1.01e was modified based on feedback collected from the JOIN 1.0 Delta Usability Feedback Survey. The JOIN 1.01e model is the same instrument as JOIN 1.0 Delta except for a reduction in the number of work activity items. This alteration is postulated to reduce the likelihood that participants perceived the instrument as repetitive. The content of JOIN 1.01e consists of: 1 multiple response community item, 8 work environment items, and 2 sets of 26 work activity items (item-couplets). All responses collected from participants are stored electronically in an Microsoft Excel spreadsheet. Data have been converted into SPSS format for statistical analyses.

Procedure

Prior to administering JOIN 1.01e, a pre-inventory script was read to participants (See Appendix E for the pre-inventory script). Materials from the pre-inventory script consisted of a short description of JOIN 1.01e along with the basic nature of questions appearing in the instrument. Statements about confidentiality and voluntary participation were provided to meet current ethical standards of research.

Throughout this study, JOIN 1.01e was administered to recruits on the third or fifth day after arriving at RTC. Similar to previous validation efforts, Navy recruits were gathered by divisions (approximately 80–100 future Sailors) in an open-bay area and were called for medical and dental in-processing that included eye examination, vaccination, health education, dental check-up, and dental hygiene. Those individuals who were waiting to be called for processing or immediately following processing were asked to participate in this study. JOIN 1.01e took approximately 15 minutes to complete.

The first 1,000 participants received a Usability Feedback Survey that assessed different aspects of JOIN 1.01e. Specifically, the combination of Likert-scaled items and open-ended questions evaluated the ease of use, clarity of instructions, readability of descriptions, ratings of the tutorial, and visual appeal of the instrument. These items served as the basis for future modifications. (See Appendix F for a copy of the Usability Feedback Survey)

For the convenience-sampled discussion groups, roughly six to eight participants were asked to provide feedback regarding their understanding of instructions, images, job descriptions, and area differentiation (i.e., community area versus work-styles versus work activities, etc.). These discussion groups were held immediately following JOIN 1.01e and Usability Feedback Survey administrations. Information collected from these groups was utilized to determine the programs' functionality under certain organizational constraints (e.g., available test time, recruit characteristics). The Usability Feedback Survey followed by a group discussion required an additional 10–15 minutes to complete.

Instrument Reliability

The reliability portion of the study contained two parts. First, reassessments of internal consistencies among the work activity items were required to examine and to compare the alpha level of the current work activity couplets to the original work activity triplets. Due to reductions in process-content (P-C) items, it was necessary to assess the reliability coefficients to ensure that the reduction in work activity items did not impose any detrimental effect on the internal consistency of the instrument. Alpha reliability analyses were conducted on each of the 26 P-C pairs (item-couplets) to determine whether the reduction of items would sustain a good or reasonable level of internal consistency.

Second, subgroup differences on internal consistency were also examined. Evaluation of subgroup differences among genders and racial groups were assessed to ensure that the instrument was no less reliable or valid for any specific subgroup. By using the following formula provided in Bonett (2003), the alpha coefficients between

the gender and racial subgroups were compared to determine whether the internal consistencies among subgroups were statistically significant.

$$z = \frac{\ln(\delta)}{\left[\frac{2k_1}{(k_1-1)(n_2-2)} + \frac{2k_2}{(k_2-1)(n_2-2)}\right]^{1/2}}$$

$$\text{where } \delta = \frac{(1-p_1)}{(1-p_2)}$$

According to Bonett (2003), the above equation may be used to compare "two independent groups of size n_1 and n_2 where ρ_1 is (the internal consistency) estimated in Group 1 from a test having k_1 parts and ρ_2 is estimated in Group 2 from a test having k_2 parts." (p. 73) For statistical analysis, the researcher evaluated z-scores generated from the equation with $z_{\alpha/2} = 1.96$ ($z_{\alpha/2}$ represents a 2-tailed critical z-value for the specified α level). More precisely, if $z > z_{\alpha/2}$, then $\rho_1 < \rho_2$; if $z < -z_{\alpha/2}$, then $\rho_1 > \rho_2$; otherwise, the results were statistically insignificant.

Instrument Validity

The assessment of the validity of JOIN was a two part process. First, predictive validation analyses were conducted to assess the potential impact of the instrument. Correlation analyses were used to survey the relationship between individual job fit (in accordance with their rating) and NPRST First Watch data (including Exit Survey, New Sailor Survey, RTC Graduate Survey, and Apprentice School Graduation Survey) collected during recruits' basic and job training. More specifically, five items from the New Sailor Survey, four items from the RTC Graduate Survey, four items from the Apprentice School Graduation Survey, and two items from the Exit Survey were used for the predictive validation effort (see Appendix G for the First Watch items). These items covered topics such as expectation of training success, satisfaction with the classification process, job satisfaction, and motivation to leave the Navy.

Second, a modified version of the Usability Feedback Survey was provided to the first 1,000 research participants to gather feedback concerning numerous facets of JOIN 1.01e. Similar to the previous survey, items such as ease of use, instruction rating, information, and content rating were given in Likert-type scaling. Other questions such as the amount of weekly computer usage prior to arriving at basic training and open-ended questions were also asked to determine whether further revision of JOIN was warranted. Items concerning special skills (e.g., musical ability, foreign language and special license or certification) were included to assess the need to include items that correspond with special skills ratings (e.g., Musicians). By conducting analyses of variance (ANOVA) and correlation analyses using the Usability Feedback Survey, this segment of instrument validation could serve as an assessment of the face validity of JOIN.

Results

Internal Consistency (Alpha Reliability) Analyses

To determine the acceptability of work activity item reduction from three pairs to two pairs, a reassessment of the internal consistencies was conducted. Cronbach's alpha was calculated on each individual pair of work activity items (item-couplets). Results showed that the average internal consistency among all 26 item-couplets was .854 (N = 4,348; Appendix H), which was a minor decrease from .895 of the original prototype with item-triplets. In addition, the previous reliability estimates for individual work activity items ranged between .830 (Operate Mechanical Equipments) to .945 (Make Facilities). The current version of item-couplets estimated a range between .768 (Make Communications) to .914 (make facilities). With 300 subjects randomly selected from the total 4,348 cases, alpha estimates ranged between .776 (Make Communications) to .924 (Maintain Security). In fact, this simple numeric comparison has shown that the item reduction effort increased the alpha reliability of two work activities (Maintain Security and Maintain Weapons) when comparing the original 287 participants from the previous version to the current version with 4,348 cases (See Appendix I). With the randomly selected 300 cases (300 of 4,348), the alpha levels for Maintain Security, Maintain Weapons, Make Documents, and Operate Weapons increased. The change in internal consistency for individual work activities ranged from -.050 to .091 when comparing the original 287 cases to the current 4,348 cases. For the randomly selected 300 cases, changes in the alpha levels ranged between -.070 to .086. With the exception of Direct Emergency Response, Make Facilities, Make Communications, and Operate Electronic Equipment, the changes for work activity items did not exceed .07 when compared to the previous version (N = 287). The changes in alpha when comparing nearly equal cases (287 vs. 300) did not exceed 0.07, with the exception of Maintain Facilities, Make Communication, Respond To Emergencies, and Serve Customers.

Subgroup Comparisons on Alpha Reliability

After analyses of internal consistencies among all identifiable minority and gender groups, results suggested that the instrument maintained a high level of internal consistency among subgroups. For example, the self-identified Asian-American, African-American, Hispanic-American, and Caucasian-American participants averaged .847, .842, .849, and .856 on all 26 process-content item pairs (item-couplets), respectively (Appendix J). Among all items from the Asian-American subgroup, Operate Mechanical Equipment showed the lowest internal consistency of .706 while Make Facilities showed the highest at .922. Within the African-American subgroup, Operate Electronic Equipment (α = .771) showed the lowest internal consistency and Operate Weapons (α = .904) the highest. For Hispanic-American participants, the least reliable item-couplet was Make Communications with α = .744, and the most reliable was Operate Weapons with α = .929. Lastly, Caucasian-American participants received higher average internal consistency for the work activity items (α = .856) than other subgroups. The range of internal consistency for white participants was between .767 (Make Communications) and .927 (Make Facilities). In order to discover whether any

differences among racial subgroups were significant, statistical comparisons among independent alpha coefficients (Bonett, 2003) were conducted. Results showed that there were no statistical differences among racial subgroups concerning the overall average alpha coefficient of work activity items within JOIN 1.01e (Appendix K). In other words, the statistical results suggested that the differences among racial groups were statistically insignificant.

Comparison of internal consistencies between the two gender groups presented positive results. With averaged reliability coefficients of .847 and .854 for respective male and female subgroups, the least reliable item-couplet for male participants was Make Communications (.754), and Maintain Facilities (.772) for females (Appendix L). The most consistent item-couplet was Make Facilities (α = .910) for the male participants, and Operate Office Equipment (α = .924) for females. Statistical comparison on the two alpha coefficients suggested that the difference between the two gender groups was not statistically significant (z = .494; Appendix K).

Predictive Validity of JOIN 1.01e

As a result of characteristic anomalies in the First Watch surveys (lower value represents higher traits), reverse coding was required for all analyzed data. Correlation analyses among JOIN Fit scores and cross-sectional survey data were conducted. None of the Exit Survey items was significantly associated with JOIN Fit scores. Throughout the New Sailor Survey, the expectation of recruits' success in training was positively correlated with JOIN Fit scores (r = .051, p = .032; Appendix M). Sailor responses indicated that satisfaction with training school guaranteed at classification (prior to entry) was positively correlated with JOIN Fit score (r = .059, p = .012). Contrary to expectations, greater preparation for basic training was negatively associated with JOIN Fit (r = -.049, p = .040). Furthermore, no significant correlations were found between JOIN Fit and satisfaction with the amount of time spent with a job counselor (i.e., enlisted classifier) (r = -.034, p = .150) and the amount of information provided on the assigned classification (r = .042, p = .076).

Within the RTC Graduate Survey, there were four items significantly associated with JOIN Fit. The extent to which the following items were explained to the recruits resulted in positive, significant correlations: Navy jobs available to you at graduation (r = 0.065, p = 0.021), job that was assigned at classification (r = .059, p = .036), and school that was guaranteed at classification (r = .076, p = .007). In contrast, individuals who were reclassified or wished to be reclassified during boot camp training were significantly and negatively correlated with JOIN Fit scores (r = -.179, p < .001). Lastly, results from the Apprentice School Graduation Survey indicated that greater satisfaction with their current rating was significantly related with higher JOIN Fit scores (r = .149, p = .009).

Usability Feedback

A usability feedback survey was designed and employed to offer insight into the practical usefulness of JOIN 1.01e. Descriptive analyses on the Likert-scaled items indicated that 93.7 percent and 90.9 percent of the participants evaluated *Ease of Use* and *Instructions* as good or very good, respectively. Based on similar aggregation of good or very good ratings, the majority of participants also rated the following items positively: tutorials (80.9%), visual appeal (85.9%), ability to hold the attention of participants (66%), understanding the pictorial items representation (93.6%), and perceived increase of knowledge due to the usage of the instrument (70.3%). Next, almost all participants indicated that JOIN 1.01e was equal to or better than paper-pencil format inventories (96.9%). For face validity, 91.3 percent felt that the pictures related well or very well with the descriptions provided in JOIN 1.01e. Furthermore, 84.7 percent of participants indicated that the combination of pictures and descriptions is more informative than text alone. The adjusted mean (after removing participants outside of 3 standard deviations) for average time spent on computers prior to basic training was 17.19 hours, with 88.3 percent of participants rating themselves as average to expert users.

Inferential statistical tests were conducted to assess significant relationships among the survey items. Analyses of variance (ANOVA) and post hoc analyses (Tukey HSD & Bonferroni) indicated that there were significant differences between the individuals who used both pictures and text to rate the quality of instructions. Participants who used both text and pictures to determine their responses during the administration of JOIN 1.01e rated the instrument's instructions higher than those using text or pictures alone ($F(2, 961) = 9.143$, $p < .001$; Appendix N). Tukey HSD and Bonferroni post hoc analyses suggested that participants rated the tutorials of JOIN 1.01e significantly higher when using both text and pictures to respond to JOIN items than when using textual information alone ($F(2, 959) = 5.087$, $p = .006$). Furthermore, Tukey HSD, Bonferroni, and Games-Howell post hoc analyses agreed that JOIN 1.01e held participants' attention better when the participants used both pictures and text to evaluate their responses than when using the textual descriptions only ($F(2, 959) = 5.390$, $p = .005$). Participants responded more positively on their understanding of the information presented in each picture when they used both text and picture rather than these components individually ($F(2, 974) = 9.365$, $p < .001$; post hoc agreement among Tukey HSD, Bonferroni, & Games-Howell). Significant differences were found on the perceived amount of knowledge gained by using JOIN 1.01e when individual responses were based on both textual (descriptions) and pictorial (images) stimuli, or based on judgments of these stimuli independently, ($F(2, 970) = 13.294$, $p < .001$). Post hoc analyses using Tukey HSD, Bonferroni, and Games-Howell agreed that subjects who evaluated their responses using both textual descriptions and pictorial images rated significantly higher on perceived knowledge (among Navy enlisted ratings) gained than subjects who used text alone ($p < .001$). Lastly, results suggested that the individuals who based their responses on the pictorial stimuli alone perceived they had gained more knowledge after the administration of JOIN 1.01e than individuals who based their responses on textual information alone ($p = .005$).

In summary, when individuals view textual and pictorial stimuli, they tended to perceive JOIN 1.01e as (1) having high quality instructions and tutorials, (2) better able to hold participants' focus throughout survey administration, and (3) more capable of inducing high levels of understanding about the jobs within the Navy's enlisted community (in comparison to traditional paper-pencil vocational interest inventories). The statistical outcomes suggest that the images in JOIN provide significant understanding about Navy ratings compared with text-only job descriptions. These results indicate that JOIN 1.01e has a high degree of face validity.

Non-partial correlation analyses were conducted among the usability feedback items to discover any indication of how participants responded to the JOIN items. Results show that responses between individual rating on the *Ease of Use* item and its visual appeal suggested that these two items correlated at the .337 level ($p < .001$). In addition, the *Ease of Use* rating was highly correlated with the individual ratings of instruction ($r = .634$, $p < .001$) and tutorials ($r = .451$, $p < .001$). Participants tended to rate the instructions more positively when the tutorial ratings were higher ($r = .537$, $p < .001$). Time spent on using computers was positively correlated with the self-assessment of individual computer skill level ($r = .389$, $p < .001$).

Because participants reported that items from JOIN 1.0 Delta were repetitive, a regression analysis was conducted to explore variables that affected the amount of attention JOIN 1.01e was holding among individuals. Stepwise linear regression (Appendix O) indicates that the visual appeal of the instrument accounts for 31 percent of the variance on how JOIN 1.01e holds individuals' attention during administration ($F(1, 845) = 370.177$, $p < .001$). The second step consists of the *Visual Appeal* item rating and the item "How did JOIN do at increasing your knowledge of Navy work areas, styles, and activities?" Results indicate that the combination of these variables accounted for 40 percent of variance on how JOIN 1.01e holds the attention of respondents ($F(2, 844) = 269.952$, $p < .001$). The third step included an additional variable *Instructions rating* that accounts for 40.3 percent of the variance on how JOIN 1.01e holds the attention of participants ($F(3, 843) = 189.403$, $p < .001$). Lastly, the combination of four items: *Visual Appeal* rating, "How did JOIN do at increasing your knowledge of Navy work areas, styles, and activities," *Instruction* rating, and "how does JOIN compare to other paper-pencil formatted instruments" accounts for 41 percent of the total variance on JOIN 1.01e's ability to hold participants attention ($F(4, 842) = 146.451$, $p < .001$). The stepwise analysis excluded several moderately to highly correlated variables such as *Ease of Use* rating ($r = .267$, $p < .001$), *Tutorial* rating ($r = .358$, $p < .001$), "how the description relates to the pictures" ($r = .311$, $p < .001$), and "how well could you understand what was being presented in each picture" ($r = .327$, $p < .001$) because these variables do not provide any incremental variance to the criterion (i.e., ability to hold participants attention). If all variables mentioned are included within the regression analysis, these items would have accounted for 41.7 percent of the total variance on the amount of attention JOIN 1.01e holds from participants ($F(10, 836) = 59.870$, $p < .001$). In summary, the overall results of the stepwise linear regression analysis showed that the amount of attention JOIN 1.01e holds for participants was highly dependent upon the visual appeal of the instrument, the amount of knowledge JOIN 1.01e provides, and the perceived quality of the instructions.

Furthermore, when individuals rated JOIN 1.01e as a better assessment tool than other traditional paper-pencil inventories, it also added some incremental variance to the ability of JOIN 1.01e to hold participants' attention throughout administration.

Discussion

It is hypothesized that the Navy selection and classification system generates a proportion of Sailors who are misfit to their assigned ratings/jobs. As a result, development of an interest inventory that creates higher person-organization and person-job fit is necessary to fill this gap in the Navy's selection and classification system. In an attempt to reduce attrition by increasing work satisfaction, organizational commitment, work performance, and intrinsic motivation, JOIN was hypothesized to reduce a major part of selection, classification, training, and attrition costs by maximizing the match between individual interests and assigned Navy ratings. Therefore, the overall purpose of JOIN is to assess the work interests of recruits who have volunteered to enter the Navy's world-of-work, as well as to place these recruits into the ratings where they are more likely to be satisfied, committed, motivated, and perform at a higher level.

Results from this phase of instrument validation produced several promising outcomes. First, the internal consistency of the instrument, after the reduction of work activity items, remained strong. As mentioned previously, the main difference between the first JOIN prototype (JOIN 1.0 Delta) and a subsequent version (JOIN 1.01e) is the number of process-content items within each work activity: the current version was reduced from item-triplets for each work activity to item-couplets. Comparisons between these two variants of JOIN indicate that the work activity item-couplets continued to produce medium to high internal consistency after the item reduction. With an overall average of .854 on alpha reliability among all work activity items, the instrument maintained a good level of internal consistency. Even the most inconsistent item (make communications) produced an alpha reliability of .768 within the item-couplets. Therefore, current data suggest that work activity items of JOIN 1.01e produce high levels of reliability among participants. With limited time available to administer JOIN (Navy classifiers suggest keeping administration time less than 20 minutes), JOIN 1.01e achieves more than acceptable levels of internal consistencies with the average administration time between 15-20 minutes.

Stemming from a large number of participants (N = 4,348) in the JOIN 1.01e dataset, assessment of internal consistency among the work activity item-couplets with a sample of 300 randomly selected participants was necessary to compare these data with the previous 287 sampled participants from JOIN 1.0 Delta. The reduction in sample size did not detriment the internal consistency of the instrument greatly. Results showed that with 300 randomly selected cases (from a pool of 4,384 participants), the average overall alpha was .856, with the lowest α = .776 (Make Communications) and highest α = .924 (Maintain Security). The current reliability estimates resulted in a medium to high level of internal consistency. Moreover, the instrument did not show any significant differences on the internal consistencies among individual subgroups

(i.e., racial groups and gender). In other words, although minor numerical differences were present among the racial and gender subgroups, there were no statistically significant differences. More importantly, these analyses may be used as baseline data for future studies on whether JOIN will produce adverse impact, even though the instrument is designed to supplement rather than replace the current selection and classification system.

Predictive validity of JOIN 1.01e shows optimistic results. Correlation analyses indicate that individual JOIN Fit scores generated from the algorithm of the instrument were positively correlated with self expectation of basic training success, satisfaction with guaranteed rating (job), amount of job-related information provided at classification, satisfaction with the assigned rating, satisfaction with the "A" school guaranteed at classification, and satisfaction with the individual rating at the time of administration. Furthermore, JOIN Fit was negatively correlated with individuals who have been or have requested to be reclassified during basic training. Although the relationships are small, the results suggest that the instrument may become a valuable supplement to the current selection and classification system; JOIN 1.01e adds additional information concerning how satisfied the individuals are with their classified ratings, self-expectation of training success and job satisfaction. Using JOIN as a supplement to the current evaluation of individuals' cognitive ability and other psychological and physiological factors will enable the Navy to incorporate non-cognitive assessments (specifically, vocational interests assessment) into the process of selection and classification. Consequently, when new recruits are classified into ratings that have high vocational interest fit, they will more likely be satisfied with their job, more committed to the organization, and perform better, as well as being more intrinsically motivated to their jobs. In addition, the Navy's attrition rate is also likely to decline (Saks & Ashforth, 1997).

Once all previous participants have completed Class A technical school training and their initial enlistment period (as specified on their contract), an evaluation of attrition and satisfaction among this cohort may be possible. When these data become available, predictive and concurrent validation can continue to assess long-term effects of JOIN on the Navy selection and classification system.

The assessment of usability of JOIN 1.01e provides positive feedback concerning many aspects of the instrument. A majority of the participants indicated that JOIN 1.01e was easy to use, with good instructions and tutorials to assist in understanding the activities involved in administration. Furthermore, respondents indicated that the instrument contains good visual appeal and holds participants' attention. The pictures were understandable and relevant to the descriptions provided. Roughly 70 percent of the participants expressed that they gained significant knowledge about Navy ratings after taking JOIN 1.01e. Collectively, these descriptive outcomes indicate that JOIN 1.01e may be a useful tool that provides knowledge concerning the Navy enlisted ratings, and assesses vocational interests among these ratings.

Analysis of variance (ANOVA) results from the usability survey indicate that the images included within JOIN served as a better tool than the descriptive text alone. Moreover, participants responded more positively, gained more knowledge, and paid more attention when the images were used along with the descriptions to determine

their responses. Correlation analyses confirmed some intuitive relationships. For example, JOIN's ease of use rating was highly correlated with individual ratings of instructions and tutorials. Furthermore, JOIN Fit scores were moderately correlated with the visual appeal of the instrument. Amount of time spent using computers was moderately correlated with individual self-assessment of computer skill level. Even though most of these relationships were intuitive, they provided indications that the instructions, tutorials, and images affect how people perceive the ease of use of JOIN items.

Stepwise linear regression analysis demonstrated that the amount of attention JOIN 1.01e held from participants was largely dependent upon (1) the visual appeal of the instrument, (2) the amount of perceived knowledge concerning the Navy's world-of-work, (3) ratings of instructions, and (4) whether the participants viewed JOIN as better than other paper-pencil formatted instruments. Therefore, in order to minimize the amount of attention lost from the perceived repetitive items, continuous improvement on the visual items should be pursued. Future researchers should persist with assessing other methods of providing instructions that may result in more positive feedback.

Although statistical outcomes were positive with respect to the internal consistencies, face validity, and predictive validity of JOIN 1.01e, four types of future studies may assist in validating this interest inventory. First, even though correlation analyses were conducted to discover the relationships between JOIN Fit scores and other self-reported performance and satisfaction items from First Watch, actual performance and satisfaction scores were not readily analyzable at this point. Therefore, it will be necessary to investigate the relationship between JOIN Fit scores and actual records of training and work performance (Hogan & Blake, 1996), training and job satisfaction (Klein & Wiener, 1977; Worthington & Dolliver, 1977; Rounds, Dawis, & Lofquist, 1987; O'Reilly, Chatman, & Caldwell, 1991; Cronbach, 1984), organizational commitment (O'Reilly et al., 1991; Chatman, 1991), and intrinsic motivation (Eisenberger, Pierce, & Cameron, 1999; Deci, Koestner, & Ryan, 1999). These studies will assist in discovering the true benefits of generating Fit by using JOIN (Edwards, 1991). Secondly, because of substantial first-term enlisted attrition, a utility analysis is warranted to determine the return on investment (ROI) of developing JOIN to assist in classification of Navy enlisted recruits. More specifically, an evaluation of the amount of expenditures saved by using JOIN to reduce first-term attrition may provide further support for the value of JOIN as a supplement to Navy selection and classification system. Third, future studies are warranted to investigate specific items that seemed repetitive. Evaluation of the responses to these seemingly repetitive items may allow researchers to understand how participants answer these specific items when perceived as repetitive. Lastly, evaluation on the usefulness of interest inventories developed using a job analysis method outside a Navy enlisted population will assist in generalizing the approach used in JOIN. An extension of JOIN should include additional components that relate to other military services and civilian jobs, and further include the capability to assess and rank interests among all available work within the military and civil service systems.

Concerning the implementation of JOIN, existing literature suggests that the interpretation of results can be key to the overall success of JOIN. For example, Zytowski (1999, p. 277-293) indicated that when recruiters interpret vocational interest inventory results for job applicants, five principal concepts should be used: (1) prepare for the discussion of results by familiarizing themselves with the large and small details of the inventory, (2) involve prospective recruits in communicating the results, (3) use simple, but emphatic, language or illustrations throughout discussion, (4) ask prospective recruits to recapitulate their results by using their own words, and (5) stimulate continuing career development by identifying steps or methods for exploring career options suggested throughout the discussion of the assessment results. According to Goodyear (1990), appropriate interpretation of vocational interest assessment results may stimulate client satisfaction, as well as increase exploratory behavior and enhance vocational identity and career maturity. Put differently, by using these principles, the Navy can ensure that the utility of JOIN is maximized.

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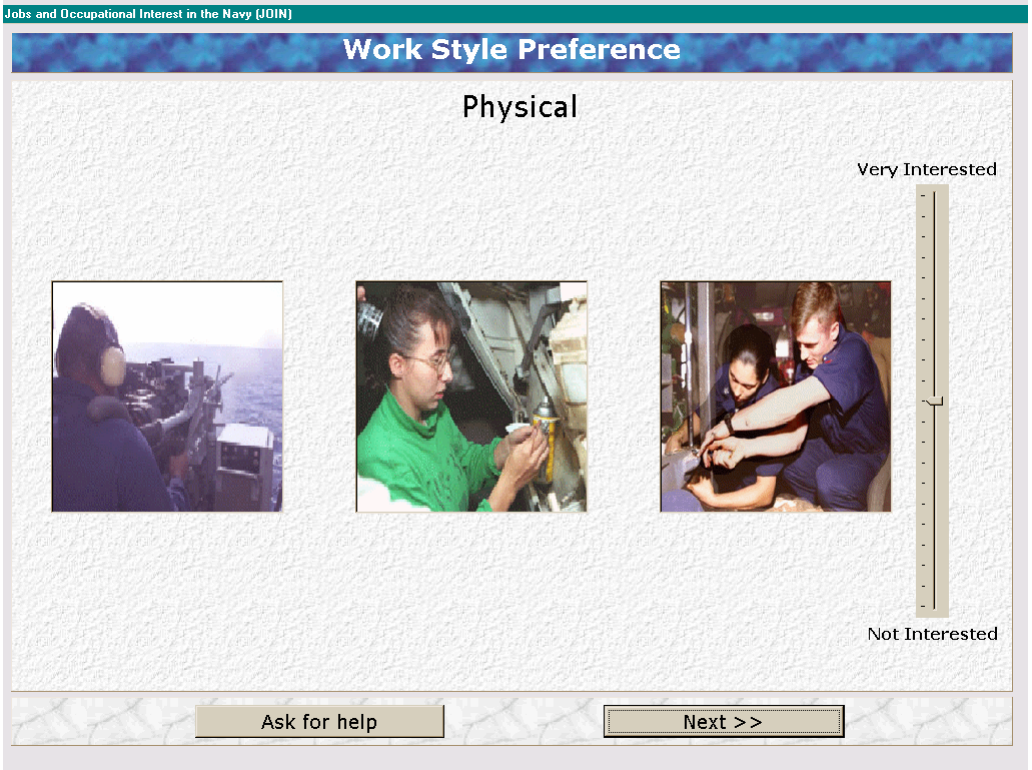
Appendix A:
JOIN Facets

JOIN Facets

Navy Community Areas	Work Activities
Aviation	Analyze Communications
Construction	Analyze Data
Health Care	Analyze Documents
Intelligence	Direct Aircraft
Submarine	Direct Emergency Response
Surface	Maintain Documents
Special Programs	Maintain Electrical Equipment
	Maintain Electronic Equipment
	Maintain Facilities
	Maintain Mechanical Equipment
	Maintain Security
	Maintain Supplies
	Maintain Weapons
	Make Communications
Work Styles/Work Environments	Make Documents
Mental	Make Facilities
Physical	Make Mechanical Equipment
Independent	Operate Electrical Equipment
Team	Operate Electronic Equipment
Indoors	Operate Facilities
Outdoors	Operate Mechanical Equipment
Industrial	Operate Office Equipment
Office	Operate Weapons
	Respond to Emergencies
	Serve Customers
	Train People

Appendix B:
Example Screenshots of JOIN 1.01e


Jobs and Occupational Interest in the Navy (JOIN)
Community Preference
Navy jobs are organized in the Community areas shown below. Please click on each community you are interested in and move each to the right with the arrow button. Then use the arrows on the right to rank order your communities of interest.
Not Interesting
Aviation
Intelligence
Healthcare
Construction
Surface
Submarine
Special Programs
More Interesting
Less Interesting
Next >>

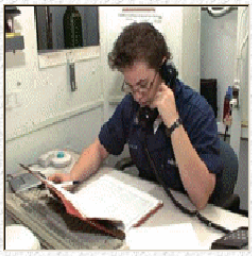

Jobs and Occupational Interest in the Navy (JOIN)
Work Style Preference
Physical
Very Interested
Not Interested
Ask for help
Next >>

Jobs and Occupational Interest in the Navy (JOIN)

Work Style Preference

Mental

Very Interested


Not Interested

Ask for help | Next >>

Jobs and Occupational Interest in the Navy (JOIN)

Work Activity Preference

Maintain Weapons

Service and repair small arms, missile systems and other munitions.

Very Interested



Not Interested

Ask for help | Next >>

Appendix C:
JOIN Job Ranking Algorithm

JOIN Job Ranking Formula

There are three sets of recruit preference data

(i) Functional Category (OSG or community)
(ii) Process Preference
(iii) Environment Preference

These three categories are assumed to represent fundamentally different aspects of a job, and therefore each is used to derive a single value (weight) before the three values are combined to give an overall job ranking.

For category (i) – Functional Category, retrieve the ranking in the preference set (set arbitrary large value (e.g., 99) for those functional areas not preferred). The weight W_{1i} for job *i* is calculated as

$W_{1i} = \min(r_{ii})$ for OSGs preferred by candidate, where r_{ii} are the preference ordinals for all the OSGs/communities *j* in which job *i* is a member (and $r_j = 99$ for OSGs/communities which are not preferred)

For category (ii) – Process Preference, where candidate preference is scored 0-1[1], it is assumed that the set of variables represents a spanning set across the job space, and that each variable is independent and equally weighted. Then derive a combined value for Process Space Preference as the normed "distance" between the candidate preferences and the job attributes [referred to as Deoxyribonucleic acid (DNA) in this case, an underlying pattern structure of variables 0 or 1]. This value (W_{2i} for job i) will be between 0 and 1.

$W_{2i} = [\Sigma_p(c_p - j_{ip})^2]^{1/2} / P^{1/2}$
where the sum is over the P process attributes (variables)
c_p is the candidate preference value for attribute p
j_{ip} is the job DNA value for job i for attribute p

For category (iii) – Environment Preference, similar reasoning applies (namely that the set of variables represents a spanning set across the job space, and that each variable is independent and equally weighted), however there is a wrinkle in the implementation. Candidate preference is scored as a single value between two presumably related variables (e.g. indoor and outdoor) thus a candidate cannot express 100 percent satisfaction with outdoor work and at the same time 100 percent satisfaction with indoor work. On the other hand, preliminary data used for job attributes indicates that there is no relationship between the job "DNA" values for the two supposedly related variables. Although this implementation appears contradictory, it is assumed that there is sufficient reason for this approach. It is therefore recommended[2] that first the two job attribute values are converted to a single value for the paired variable, by taking the

[1] It is assumed in the text that all percentage preferences are converted to a 0-1 fraction.
[2] Based on two factors – (i) the supposition of a relationship between the paired variables is correct, and (ii) this relationship will be substantiated in the job DNA data as that data is refined in the course of time.

appropriate proportion of the sum of the two values, and that this is then used in a normed distance calculation as described for category (ii) above. This value (W_{3i} for job i) will also be between 0 and 1.

$W_{3i} = [\Sigma_e(c_e - j_{ie})^2]^{1/2} \ / \ E^{1/2}$

where the sum is over the E paired environment meta-attributes (variables), each of which comprises two complementary attributes e1 and e2
c_e is the candidate preference value for meta-attribute e (defined as = c_{e2})
j_{ie} is the relative job "DNA" value for job i for meta-attribute e, calculated as $j_{ie} = j_{ie2} / (j_{ie1} + j_{ie2})$ (thus between 0 and 1)

The three weights are combined to get a ranking value for each job i as follows:

$$JobRankValue_i = W_{1i} * (W_{2i} + W_{3i})$$

and the jobs can then be ranked in order of lowest JobRankValue first.

Finally, a simple conversion of each $JobRankValue_i$ to JOIN Fit Score:

$JobRank_i$ = the ranking of individual $JobRankValue_i$ from 0 to 79

* All $JobRank_i$ values are integers.

$$JOIN\ Fit_i = 100 - JobRank_i$$

Now, the jobs will be ranked in order of highest ranked JOIN Fit Score first.

Appendix D:
Example Calculation for JOIN $JobRankValue_i$

Example Calculation for JOIN $JobRankValue_i$

DATA

Variable		Candidate Preference	Job Attributes (DNA) Job1	Job2	Job3	Job 4	Job5
Category							
	Air	1	1	0	0	0	0
	Surface	3	1	1	0	0	0
	Sub-surface	4	0	0	1	1	0
	Nuclear	2	0	1	1	0	0
	Space Exploration	none	0	0	0	0	1
Process							
	Mechanical	0.3	1	0	1	0	0
	Intuitive	0.2	0	1	0	1	0
	Creative	0.9	0	0	0	0	1
	Precise	0.5	1	1	1	1	1
Environment							
	Indoor /	0.7	0	1	1	1	1
	Outdoor	=(1-0.7) = 0.3	1	0	0	0	0.5
	Jolly /	0.5	1	1	0	1	0
	Serious	=(1-0.5) = 0.5	0	1	1	0	1

CALCULATION

Job1

W1 min(1,3) = 1

W2 $SQRT((0.3-1)^2 + (0.2-0)^2 + (0.9-0)^2 + (0.5-1)^2) / SQRT(4)$
=SQRT(0.34)/2 = 0.29

W3 $SQRT((1-0.3)^2 + (0-0.5)^2) / SQRT(2)$
=SQRT(0.74)/1.4 = 0.61

$JobRankValue_1$ = 1 * (0.29 + 0.61) =**0.90**

Job2

W1 min(3,2) = 2

W2 SQRT((0.3-0)2 + (0.2-1)2 + (0.9-0)2 + (0.5-1)2) / SQRT(4)
=SQRT(0.29)/2 = 0.27

W3 SQRT((0-0.3)2 + ([1/(1+1)]-0.5)2) / SQRT(2)
=SQRT(0.3)/1.4 = 0.21

$JobRankValue_2$ = 2 * (0.27 + 0.21) = **0.96**

Job3

W1 min(4,2) = 2

W2 SQRT((0.3-1)2 + (0.2-0)2 + (0.9-0)2 + (0.5-1)2) / SQRT(4)
=SQRT(0.34)/2 = 0.29

W3 SQRT((0-0.3)2 + (1-0.5)2) / SQRT(2)
=SQRT(0.34)/1.4 = 0.41

$JobRankValue_3$ = 2 * (0.29 + 0.41) = **1.40**

Job4

W1 min(4) = 4

W2 SQRT((0.3-0)2 + (0.2-1)2 + (0.9-0)2 + (0.5-1)2) / SQRT(4)
=SQRT(0.29)/2 = 0.27

W3 SQRT((0-0.3)2 + (0-0.5)2) / SQRT(2)
=SQRT(0.34)/1.4 = 0.41

$JobRankValue_4$ = 4 * (0.27 + 0.41) = **2.72**

Job5

W1 min(99) = 99

W2 SQRT((0.3-0)2 + (0.2-0)2 + (0.9-1)2 + (0.5-1)2) / SQRT(4)
=SQRT(1.06)/2 = 0.51

W3 SQRT(([0.5/(1+0.5)]-0.3)2 + (1-0.5)2) / SQRT(2)
=SQRT(0.28)/1.4 = 0.38

$JobRankValue_5$ = 99 * (0.51 + 0.38) = **88.11** (!)

RESULT

The final Job Ranking is therefore:

(1) Job1 [0.90]
(2) Job2 [0.96]
(3) Job3 [1.40]
(4) Job4 [2.72]
(5) Job5 [88.11]

To present the Job Ranking by JOIN Fit scores:

(1) Job1 [100]
(2) Job2 [99]
(3) Job3 [98]
(4) Job4 [97]
(5) Job5 [96]

Appendix E:
Pre-Inventory Script

Pre-Inventory Script

You are being invited to participate in the development of a Navy classification tool called Jobs and Occupation Interest in the Navy (JOIN) developed by Navy Personnel Research, Studies, and Technology (NPRST). JOIN is a computer-administered survey that intends to measure recruits interests on the different aspects of the Navy jobs. Your responses will help us to better understand the interests of future Sailors.

This is a longitudinal study, so we will track you throughout your Navy career to participate in follow-up studies. Before you start, you will be asked to enter you Social Security Number (SSN). If you wish not to enter your SSN, substitute your SSN with 999-99-9999. At this moment, please raise your hand if you do not wish to include your SSN. (Record the number of SSN versus no SSN participants)

Throughout the test, you will see each work activity twice. Therefore, the items may seem repetitive. However, please answer each question independently. Once you have completed the inventory, please pick up a copy of the Usability Feedback Survey, and answer the questions to the best of your ability. Participation in this study is completely voluntary. All information you provide will be kept in confidence, and will only be used for research purposes. Therefore, your responses will not be identified individually. In other words, your involvement with this survey will not affect your Navy career in any way.

At this point, does anyone have any questions before you start? (If not) You may enter your Social Security Number and click the “Next” button to start the survey.

Appendix F:
JOIN Usability Feedback Survey

JOIN Usability Feedback Survey

The purpose of this questionnaire is to evaluate the quality of the computer software, JOIN. Your responses will be analyzed and maintained by Navy researchers (NPRST/PERS-13). All responses will be held in confidence. Information provided will be summarized and will not be attributable to individuals. Your participation is completely voluntary. Failure to respond will NOT result in any penalties with the exception of lack of representation of your views in the final results and outcomes.

Please take a moment to reflect back on JOIN and answer the following questions:

Usability

	Very Bad	Bad	Neither	Good	Very Good
1. How would you rate JOIN on the following:					
a. Ease of use…	○	○	○	○	○
b. Instructions…	○	○	○	○	○
c. Tutorials (i.e., practice screens)…	○	○	○	○	○
d. Visual appeal…	○	○	○	○	○
e. Holding your attention…	○	○	○	○	○

	Worse	Equal	Better
2. Was JOIN worse than, the same as, or better than paper and pencil surveys you have taken?	○	○	○

Information & Content

	Very Bad	Bad	Neither	Good	Very Good
3. How well did the headings (i.e., textual descriptions) relate to the pictures on each screen?	○	○	○	○	○
4. How well could you understand what was being represented in each picture?	○	○	○	○	○
5. How did JOIN do at increasing your knowledge of Navy work areas, styles, and activities?	○	○	○	○	○

	Pictures Only	Text Only	Both
6. What did you use to make your decision about your level of interest for each work area and activity?	○	○	○

	No	Yes
7. Did the pictures provide you with better information than the text alone?	○	○

	Not interested	50%	Very interested
8. If you liked **one** picture "very much" out of the three presented, how would you respond?	○	○	○
9. If you liked **two** pictures "very much" out of the three presented, how would you respond?	○	○	○
10. If you liked **all three** pictures "very much" how would you respond?	○	○	○

Feedback & Opinions

11. What did you like about JOIN?

12. What did you dislike about JOIN?

13. Suggestions/ Recommendations?

Learning Environments

Instructions: Please darken to circle next to the leaning environment you would **most prefer**.

14. Computer based training (CBT), which would occur from a personal computer or designated locations in the community. ○

15. Traditional classroom training, which would be led by a trained instructor and would take place from a designated location in the community. ○

General Information

16. Before coming to boot camp, how many hours per week did you spend using a computer? _____ # HRS

17. With regard to your computer skills, would you say that you are…

Not experienced, but I know where the ON switch is but I am scared to use it ○

Need help to do most things ○

Average (email, internet, word processing, etc.) ○

A wide variety of software knowledge, and technical expertise ○

Very experienced, expert user, master programmer, and I can build a computer from scratch in less than 2 minutes ○

If you are an expert user please list any special abilities (e.g., programming, graphics, etc.):

18. Please list any musical instruments that you play:

19. Please list any special licenses or certification credentials you may have (e.g., mortician, draftsman, etc.):

20. Please list any foreign languages that you speak fluently:

Appendix G:
First Watch Items Used for JOIN Predictive Validation

First Watch Items Used for JOIN Predictive Validation

NQ = New Sailor Survey
RQ = RTC Survey
AQ = Apprentice School Survey
EQ = Exit Survey

NQ14 How Successful will you be in boot camp?

1. Not applicable, I am prior military
2. I will do better than most
3. I will do about as well as everyone else
4. I will not do as well as most

NQ17 How satisfied about time with classifier?

1. Not Applicable
2. Very Satisfied
3. Satisfied
4. Neither Satisfied nor dissatisfied
5. Dissatisfied
6. Very Dissatisfied

NQ19e To what extend was each of the following explained to you:
Job you were assigned at classification?

1. Very Great Extent
2. Great Extent
3. Moderate Extent
4. Slight Extent
5. Not at All

NQ19f To what extend was each of the following explained to you:
School you were guaranteed at classification?

1. Very Great Extent
2. Great Extent
3. Moderate Extent
4. Slight Extent
5. Not at All

NQ29 Preparation for RTC received from my recruiter was:

1. Not Applicable
2. Excellent
3. Good
4. Satisfactory
5. Fair
6. Poor

RQ4b The Navy jobs available to you at classification:

1. Very Great Extent
2. Great Extent
3. Moderate Extent
4. Slight Extent
5. Not at All

RQ4e Job you were assigned at classification:

1. Very Great Extent
2. Great Extent
3. Moderate Extent
4. Slight Extent
5. Not at All

RQ4f School you were guaranteed at classification:

1. Very Great Extent
2. Great Extent
3. Moderate Extent
4. Slight Extent
5. Not at All

RQ74a Were you reclassified?

1. Yes
2. No, but I wanted to
3. No, happy with rate

AQ4 A-school compared with expectations?

1. Much better than expected
2. Somewhat better than expected
3. About the same as expected
4. Somewhat worse than expected
5. Much worse than expected

AQ5 How successful were you in A-School?

1. Better than most
2. As well as most
3. Worse than most

AQ7 Satisfaction with current rate?

1. Very Satisfied
2. Satisfied
3. Neither
4. Dissatisfied
5. Very Dissatisfied

AQ60 How Navy life compared with expectations?

1. Much better than expected
2. Somewhat better than expected
3. About the same as expected
4. Somewhat worse than expected
5. Much worse than expected

EQ 63 How Navy Life compared with expectations?

1. Much better than expected
2. Somewhat better than expected
3. About the same as expected
4. Somewhat worse than expected
5. Much worse than expected

EQ64f Reasons for separation:
Lack of motivation or boredom

1. Yes
2. No

Appendix H:
Internal Consistencies of Work Activity Items on JOIN 1.0 Delta and JOIN 1.01e.

Internal consistencies of work activity items on JOIN 1.0 Delta and JOIN 1.01e.

Work Activities (Process-Content Pairs)	Item-Triplets (N = 287)	Item-Couplets (N = 4,348)	Item-Couplets (N = 300)
Analyze Communications	0.8931	0.8247	0.8336
Analyze Data	0.8706	0.8389	0.8305
Analyze Documents	0.8613	0.8481	0.8494
Direct Aircraft	0.9270	0.8890	0.8864
Direct Emergency Response	0.8974	0.8176	0.8286
Maintain Documents	0.9068	0.8430	0.8411
Maintain Electrical Equipment	0.9357	0.8753	0.8744
Maintain Electronic Equipment	0.9128	0.8625	0.8684
Maintain Facilities	0.8719	0.7942	0.7858
Maintain Mechanical Equipment	0.8687	0.8496	0.8373
Maintain Security	0.8984	0.9007	0.9241
Maintain Supplies	0.8842	0.8593	0.8253
Maintain Weapons	0.8249	0.8751	0.8945
Make Communications	0.8589	0.7678	0.7757
Make Documents	0.8814	0.8727	0.8961
Make Facilities	0.9452	0.9139	0.9065
Make Mechanical Equipment	0.9194	0.8919	0.8518
Operate Electrical Equipment	0.8980	0.8434	0.8528
Operate Electronic Equipment	0.8886	0.8058	0.8354
Operate Facilities	0.9110	0.8478	0.8836
Operate Mechanical Equipment	0.8302	0.7921	0.7917
Operate Office Equipment	0.9342	0.9133	0.9117
Operate Weapons	0.9185	0.9094	0.9195
Respond to Emergencies	0.9189	0.8609	0.8429
Serve Customers	0.9073	0.8419	0.8372
Train People	0.9053	0.8651	0.8584
Group Maximum	0.9452	0.9139	0.9241
Group Minimum	0.8249	0.7678	0.7757
Individual Group Average	0.8950	0.8540	0.8555

Appendix I:
Changes in Internal Consistencies of Work Activity Items

Changes in internal consistencies of work activity items – JOIN 1.0 Delta versus JOIN 1.01e, JOIN1.0 Delta versus JOIN 1.01e (300 random sample), and JOIN 1.01e (complete sample) versus JOIN 1.01e (300 random sample).

Work Activities (Process-Content Pairs)	Δ in Alpha (287 vs. 4,348)	Δ in Alpha (287 vs. 300)	Δ in Alpha (4,348 - 300)
Analyze Communications	0.0684	0.0595	(0.0089)
Analyze Data	0.0317	0.0401	0.0084
Analyze Documents	0.0132	0.0119	0.0013
Direct Aircraft	0.0380	0.0406	0.0026
Direct Emergency Response	0.0798	0.0688	(0.0110)
Maintain Documents	0.0638	0.0657	0.0019
Maintain Electrical Equipment	0.0604	0.0613	0.0009
Maintain Electronic Equipment	0.0503	0.0444	(0.0059)
Maintain Facilities	0.0777	0.0861	0.0084
Maintain Mechanical Equipment	0.0191	0.0314	0.0123
Maintain Security	(0.0023)	(0.0257)	(0.0234)
Maintain Supplies	0.0249	0.0589	0.0340
Maintain Weapons	(0.0502)	(0.0696)	(0.0194)
Make Communications	0.0911	0.0832	(0.0079)
Make Documents	0.0087	(0.0147)	(0.0234)
Make Facilities	0.0313	0.0387	0.0074
Make Mechanical Equipment	0.0275	0.0676	0.0401
Operate Electrical Equipment	0.0546	0.0452	(0.0094)
Operate Electronic Equipment	0.0828	0.0532	(0.0296)
Operate Facilities	0.0632	0.0274	(0.0358)
Operate Mechanical Equipment	0.0381	0.0385	0.0004
Operate Office Equipment	0.0209	0.0225	0.0016
Operate Weapons	0.0091	(0.0010)	(0.0101)
Respond to Emergencies	0.0580	0.0760	0.0180
Serve Customers	0.0654	0.0701	0.0047
Train People	0.0402	0.0469	0.0067
Group Maximum Change	0.0911	0.0861	0.0401
Group Minimum Change	0.0023	0.0010	0.0004
Group Average Change	0.0450	0.0480	0.0128

Note. Values in Parentheses Represent Negative Changes.

Appendix J:
Internal Consistencies of Work Activity Items Among Racial Subgroups (JOIN 1.01e)

Internal Consistencies of Work Activity Items Among Racial Subgroups (JOIN 1.01e)

Work Activities (Process-Content Pairs)	Asian (N=190)	Black (N=687)	Hispanic (N=625)	White (N=2,490)	Others (N=257)
Analyze Communications	0.8420	0.7962	0.8288	0.8332	0.7587
Analyze Data	0.9039	0.8106	0.8322	0.8446	0.8254
Analyze Documents	0.8681	0.8453	0.8384	0.8443	0.8370
Direct Aircraft	0.8670	0.8895	0.8881	0.8942	0.8597
Direct Emergency Response	0.8318	0.7865	0.8234	0.8289	0.7482
Maintain Documents	0.8213	0.8424	0.8251	0.8322	0.8147
Maintain Electrical Equipment	0.8521	0.8999	0.8589	0.8734	0.8733
Maintain Electronic Equipment	0.8845	0.8240	0.8505	0.8747	0.8594
Maintain Facilities	0.7768	0.7819	0.8137	0.7939	0.7744
Maintain Mechanical Equipment	0.8085	0.8568	0.8243	0.8583	0.8476
Maintain Security	0.9087	0.8889	0.8961	0.9064	0.8689
Maintain Supplies	0.8391	0.8278	0.8800	0.8509	0.9025
Maintain Weapons	0.8629	0.8888	0.8669	0.8744	0.8425
Make Communications	0.7204	0.7845	0.7438	0.7674	0.7231
Make Documents	0.8871	0.8570	0.8715	0.8672	0.8823
Make Facilities	0.9223	0.8920	0.8958	0.9265	0.8812
Make Mechanical Equipment	0.8512	0.8803	0.8888	0.9029	0.8379
Operate Electrical Equipment	0.8262	0.8124	0.8317	0.8587	0.8140
Operate Electronic Equipment	0.8459	0.7706	0.7551	0.8283	0.8081
Operate Facilities	0.8788	0.8269	0.8446	0.8407	0.8402
Operate Mechanical Equipment	0.7055	0.8123	0.7871	0.7962	0.7583
Operate Office Equipment	0.9046	0.9033	0.8967	0.9061	0.9252
Operate Weapons	0.9178	0.9040	0.9290	0.9044	0.8893
Respond to Emergencies	0.8391	0.8639	0.8692	0.8604	0.8140
Serve Customers	0.8358	0.8205	0.8361	0.8252	0.8215
Train People	0.8179	0.8367	0.8860	0.8703	0.8638
Group Maximum	0.9223	0.9040	0.9290	0.9265	0.9252
Group Minimum	0.7055	0.7706	0.7438	0.7674	0.7231
Individual Group Average	0.8469	0.8424	0.8485	0.8563	0.8335

Appendix K:
Significance Tests on Alpha Reliability of Work Activity Items

Significance Tests on Alpha Reliability of Work Activity Items

Subgroup Comparison (JOIN 1.01e)	η	α	δ	z
Male	3,307	0.8473		
Female	942	0.8541	1.0466	0.4938
Asian-American	190	0.8463		
Caucasian-American	2,490	0.8563	1.0654	1.1174
African-American	687	0.8424		
Caucasian-American	2,490	0.8563	1.0967	1.6283
Hispanic-American	625	0.8485		
Caucasian-American	2,490	0.8563	1.0542	0.9322
Asian-American	190	0.8463		
African-American	687	0.8424	0.9714	-0.2681
African-American	687	0.8424		
Hispanic-American	625	0.8485	1.0403	0.3484
Asian-American	191	0.8469		
Hispanic-American	625	0.8485	1.0106	0.0927

Note: $z_{a/2} = 1.96$

$\delta = (1 - \rho_1) / (1 - \rho_2)$

$\rho_1 = \alpha_1$

$\rho_2 = \alpha_2$

If $z_{a/2} > z > z_{a/2}$; $\rho_1 = \rho_2$

If $z > z_{a/2}$; $\rho_1 < \rho_2$

If $z > -z_{a/2}$; $\rho_1 > \rho_2$

Appendix L:
Internal Consistencies of Work Activity Items Between Gender Subgroups (JOIN 1.01e)

Internal Consistencies of Work Activity Items Between Gender Subgroups (JOIN 1.01e)

Work Activities (Process-Content PAIRS)	Male (N = 3,307)	Female (N = 942)
Analyze Communications	0.8201	0.8266
Analyze Data	0.8355	0.8463
Analyze Documents	0.8404	0.8406
Direct Aircraft	0.8881	0.8942
Direct Emergency Response	0.8152	0.8221
Maintain Documents	0.8270	0.8293
Maintain Electrical Equipment	0.8621	0.8883
Maintain Electronic Equipment	0.8583	0.8483
Maintain Facilities	0.8004	0.7722
Maintain Mechanical Equipment	0.8346	0.8646
Maintain Security	0.9005	0.8979
Maintain Supplies	0.8613	0.8515
Maintain Weapons	0.8598	0.8796
Make Communications	0.7538	0.7784
Make Documents	0.8570	0.8834
Make Facilities	0.9095	0.9161
Make Mechanical Equipment	0.8862	0.8765
Operate Electrical Equipment	0.8435	0.8329
Operate Electronic Equipment	0.8132	0.7904
Operate Facilities	0.8430	0.8589
Operate Mechanical Equipment	0.7683	0.8083
Operate Office Equipment	0.9021	0.9244
Operate Weapons	0.8985	0.9078
Respond to Emergencies	0.8525	0.8853
Serve Customers	0.8333	0.8179
Train People	0.8656	0.8644
Group Maximum	0.9095	0.9244
Group Minimum	0.7538	0.7722
Individual Group Average	0.8473	0.8541

Appendix M:
Correlation Analyses on JOIN Fit Scores and First Watch Items

Correlation Analyses on JOIN Fit Scores and First Watch Items

NQ14 How successful will you be in boot camp	Correlation Coefficient	0.051
	Sig. (2-tailed)	0.032
	N	1773
NQ17 How satisfied about time with classifier	Correlation Coefficient	-0.034
	Sig. (2-tailed)	0.150
	N	1765
NQ19E Job you were assigned at classification	Correlation Coefficient	0.042
	Sig. (2-tailed)	0.076
	N	1766
NQ19F School you were guaranteed at classification	Correlation Coefficient	0.059
	Sig. (2-tailed)	0.012
	N	1767
NQ29 Preparation for RTC received from my recruiter was	Correlation Coefficient	-0.049
	Sig. (2-tailed)	0.040
	N	1768
RQ4B The Navy jobs available to you at classification	Correlation Coefficient	0.065
	Sig. (2-tailed)	0.021
	N	1256
RQ4E Job you were assigned at classification	Correlation Coefficient	0.059
	Sig. (2-tailed)	0.036
	N	1252
RQ4F School you were guaranteed at classification	Correlation Coefficient	0.076
	Sig. (2-tailed)	0.007
	N	1251
RQ74A Were you reclassified	Correlation Coefficient	-0.179
	Sig. (2-tailed)	0.000
	N	1149
AQ7 Satisfaction with current rate	Correlation Coefficient	0.149
	Sig. (2-tailed)	0.009
	N	311

Note. Reverse coding was applied prior to data analyses.

Appendix N:
Post hoc Analyses on Usability Feedback Survey

Post hoc Analyses on Usability Feedback Survey Based on the Usage of Textual Presentation, Visual Presentation or the Combination of Both (JOIN 1.01e)

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
Q1A Ease of Use Rating	Tukey HSD	1 Pictures Only	2 Text Only	.02	.113	.983
			3 Both	-.14	.061	.054
		2 Text Only	1 Pictures Only	-.02	.113	.983
			3 Both	-.16	.100	.239
		3 Both	1 Pictures Only	.14	.061	.054
			2 Text Only	.16	.100	.239
	Bonferroni	1 Pictures Only	2 Text Only	.02	.113	1.000
			3 Both	-.14	.061	.062
		2 Text Only	1 Pictures Only	-.02	.113	1.000
			3 Both	-.16	.100	.319
		3 Both	1 Pictures Only	.14	.061	.062
			2 Text Only	.16	.100	.319
	Games-Howell	1 Pictures Only	2 Text Only	.02	.119	.985
			3 Both	-.14	.068	.097
		2 Text Only	1 Pictures Only	-.02	.119	.985
			3 Both	-.16	.103	.269
		3 Both	1 Pictures Only	.14	.068	.097
			2 Text Only	.16	.103	.269
Q1B Instructions Rating	Tukey HSD	1 Pictures Only	2 Text Only	.03	.113	.969
			3 Both	-.23(*)	.062	.001
		2 Text Only	1 Pictures Only	-.03	.113	.969
			3 Both	-.25(*)	.100	.032
		3 Both	1 Pictures Only	.23(*)	.062	.001
			2 Text Only	.25(*)	.100	.032
	Bonferroni	1 Pictures Only	2 Text Only	.03	.113	1.000
			3 Both	-.23(*)	.062	.001
		2 Text Only	1 Pictures Only	-.03	.113	1.000
			3 Both	-.25(*)	.100	.035
		3 Both	1 Pictures Only	.23(*)	.062	.001
			2 Text Only	.25(*)	.100	.035

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
Q1B Instructions Rating	Games-Howell	1 Pictures Only	2 Text Only	.03	.116	.971
			3 Both	-.23(*)	.066	.002
		2 Text Only	1 Pictures Only	-.03	.116	.971
			3 Both	-.25(*)	.101	.041
		3 Both	1 Pictures Only	.23(*)	.066	.002
			2 Text Only	.25(*)	.101	.041
Q1C Tutorials Rating	Tukey HSD	1 Pictures Only	2 Text Only	.17	.140	.442
			3 Both	-.16	.076	.104
		2 Text Only	1 Pictures Only	-.17	.140	.442
			3 Both	-.33(*)	.124	.024
		3 Both	1 Pictures Only	.16	.076	.104
			2 Text Only	.33(*)	.124	.024
	Bonferroni	1 Pictures Only	2 Text Only	.17	.140	.669
			3 Both	-.16	.076	.125
		2 Text Only	1 Pictures Only	-.17	.140	.669
			3 Both	-.33(*)	.124	.026
		3 Both	1 Pictures Only	.16	.076	.125
			2 Text Only	.33(*)	.124	.026
	Games-Howell	1 Pictures Only	2 Text Only	.17	.152	.505
			3 Both	-.16	.077	.110
		2 Text Only	1 Pictures Only	-.17	.152	.505
			3 Both	-.33	.138	.056
		3 Both	1 Pictures Only	.16	.077	.110
			2 Text Only	.33	.138	.056
Q1D Visual Appeal Rating	Tukey HSD	1 Pictures Only	2 Text Only	-.02	.138	.983
			3 Both	-.05	.075	.801
		2 Text Only	1 Pictures Only	.02	.138	.983
			3 Both	-.02	.123	.980
		3 Both	1 Pictures Only	.05	.075	.801
			2 Text Only	.02	.123	.980
	Bonferroni	1 Pictures Only	2 Text Only	-.02	.138	1.000
			3 Both	-.05	.075	1.000
		2 Text Only	1 Pictures Only	.02	.138	1.000
			3 Both	-.02	.123	1.000
		3 Both	1 Pictures Only	.05	.075	1.000
			2 Text Only	.02	.123	1.00

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
						0
Q1D Visual Appeal Rating	Games-Howell	1 Pictures Only	2 Text Only	-.02	.141	.984
			3 Both	-.05	.078	.815
		2 Text Only	1 Pictures Only	.02	.141	.984
			3 Both	-.02	.124	.980
		3 Both	1 Pictures Only	.05	.078	.815
			2 Text Only	.02	.124	.980
Q1E Holding your Attention Rating	Tukey HSD	1 Pictures Only	2 Text Only	.40	.177	.064
			3 Both	-.10	.097	.539
		2 Text Only	1 Pictures Only	-.40	.177	.064
			3 Both	-.50(*)	.157	.004
		3 Both	1 Pictures Only	.10	.097	.539
			2 Text Only	.50(*)	.157	.004
	Bonferroni	1 Pictures Only	2 Text Only	.40	.177	.075
			3 Both	-.10	.097	.867
		2 Text Only	1 Pictures Only	-.40	.177	.075
			3 Both	-.50(*)	.157	.004
		3 Both	1 Pictures Only	.10	.097	.867
			2 Text Only	.50(*)	.157	.004
	Games-Howell	1 Pictures Only	2 Text Only	.40	.184	.084
			3 Both	-.10	.105	.588
		2 Text Only	1 Pictures Only	-.40	.184	.084
			3 Both	-.50(*)	.160	.008
		3 Both	1 Pictures Only	.10	.105	.588
			2 Text Only	.50(*)	.160	.008
Q2 Comparison to Paper-Pencil Format	Tukey HSD	1 Pictures Only	2 Text Only	.04	.067	.800
			3 Both	-.06	.037	.203
		2 Text Only	1 Pictures Only	-.04	.067	.800
			3 Both	-.11	.060	.178
		3 Both	1 Pictures Only	.06	.037	.203
			2 Text Only	.11	.060	.178
	Bonferroni	1 Pictures Only	2 Text Only	.04	.067	1.000
			3 Both	-.06	.037	.265
		2 Text Only	1 Pictures Only	-.04	.067	1.000
			3 Both	-.11	.060	.228
		3 Both	1 Pictures Only	.06	.037	.265
			2 Text Only	.11	.060	.228

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
Q2 Comparison to Paper-Pencil Format	Games-Howell	1 Pictures Only	2 Text Only	.04	.082	.860
			3 Both	-.06	.041	.275
		2 Text Only	1 Pictures Only	-.04	.082	.860
			3 Both	-.11	.073	.327
		3 Both	1 Pictures Only	.06	.041	.275
			2 Text Only	.11	.073	.327
Q3 How well did the descriptions relate to the pictures on each screen?	Tukey HSD	1 Pictures Only	2 Text Only	.03	.107	.958
			3 Both	-.17(*)	.058	.008
		2 Text Only	1 Pictures Only	-.03	.107	.958
			3 Both	-.20	.095	.082
		3 Both	1 Pictures Only	.17(*)	.058	.008
			2 Text Only	.20	.095	.082
	Bonferroni	1 Pictures Only	2 Text Only	.03	.107	1.000
			3 Both	-.17(*)	.058	.008
		2 Text Only	1 Pictures Only	-.03	.107	1.000
			3 Both	-.20	.095	.097
		3 Both	1 Pictures Only	.17(*)	.058	.008
			2 Text Only	.20	.095	.097
	Games-Howell	1 Pictures Only	2 Text Only	.03	.129	.970
			3 Both	-.17(*)	.066	.025
		2 Text Only	1 Pictures Only	-.03	.129	.970
			3 Both	-.20	.114	.184
		3 Both	1 Pictures Only	.17(*)	.066	.025
			2 Text Only	.20	.114	.184
Q4 How well could you understand what was being represented in each picture?	Tukey HSD	1 Pictures Only	2 Text Only	.07	.108	.798
			3 Both	-.21(*)	.059	.001
		2 Text Only	1 Pictures Only	-.07	.108	.798
			3 Both	-.27(*)	.096	.012
		3 Both	1 Pictures Only	.21(*)	.059	.001
			2 Text Only	.27(*)	.096	.012

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
Q4 How well could you understand what was being represented in each picture?	Bonferroni	1 Pictures Only	2 Text Only	.07	.108	1.000
			3 Both	-.21(*)	.059	.002
		2 Text Only	1 Pictures Only	-.07	.108	1.000
			3 Both	-.27(*)	.096	.013
		3 Both	1 Pictures Only	.21(*)	.059	.002
			2 Text Only	.27(*)	.096	.013
	Games-Howell	1 Pictures Only	2 Text Only	.07	.110	.803
			3 Both	-.21(*)	.065	.005
		2 Text Only	1 Pictures Only	-.07	.110	.803
			3 Both	-.27(*)	.094	.014
		3 Both	1 Pictures Only	.21(*)	.065	.005
			2 Text Only	.27(*)	.094	.014
Q5 How Did JOIN do at increasing your knowledge of Navy work areas, styles, and activities?	Tukey HSD	1 Pictures Only	2 Text Only	.48(*)	.151	.005
			3 Both	-.17	.081	.082
		2 Text Only	1 Pictures Only	-.48(*)	.151	.005
			3 Both	-.65(*)	.134	.000
		3 Both	1 Pictures Only	.17	.081	.082
			2 Text Only	.65(*)	.134	.000
	Bonferroni	1 Pictures Only	2 Text Only	.48(*)	.151	.005
			3 Both	-.17	.081	.097
		2 Text Only	1 Pictures Only	-.48(*)	.151	.005
			3 Both	-.65(*)	.134	.000
		3 Both	1 Pictures Only	.17	.081	.097
			2 Text Only	.65(*)	.134	.000
	Games-Howell	1 Pictures Only	2 Text Only	.48(*)	.161	.011
			3 Both	-.17	.087	.113
		2 Text Only	1 Pictures Only	-.48(*)	.161	.011
			3 Both	-.65(*)	.143	.000
		3 Both	1 Pictures Only	.17	.087	.113
			2 Text Only	.65(*)	.143	.000

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
Q8 If you liked ONE picture "very much" out of the three presented, how would you respond?	Tukey HSD	1 Pictures Only	2 Text Only	.14	.113	.452
			3 Both	.02	.061	.954
		2 Text Only	1 Pictures Only	-.14	.113	.452
			3 Both	-.12	.100	.470
		3 Both	1 Pictures Only	-.02	.061	.954
			2 Text Only	.12	.100	.470
	Bonferroni	1 Pictures Only	2 Text Only	.14	.113	.688
			3 Both	.02	.061	1.000
		2 Text Only	1 Pictures Only	-.14	.113	.688
			3 Both	-.12	.100	.723
		3 Both	1 Pictures Only	-.02	.061	1.000
			2 Text Only	.12	.100	.723
	Games-Howell	1 Pictures Only	2 Text Only	.14	.114	.461
			3 Both	.02	.062	.954
		2 Text Only	1 Pictures Only	-.14	.114	.461
			3 Both	-.12	.101	.480
		3 Both	1 Pictures Only	-.02	.062	.954
			2 Text Only	.12	.101	.480
Q9 If you liked TWO pictures "very much" out of the three presented, how would you respond?	Tukey HSD	1 Pictures Only	2 Text Only	.02	.089	.983
			3 Both	-.03	.048	.847
		2 Text Only	1 Pictures Only	-.02	.089	.983
			3 Both	-.04	.079	.854
		3 Both	1 Pictures Only	.03	.048	.847
			2 Text Only	.04	.079	.854
	Bonferroni	1 Pictures Only	2 Text Only	.02	.089	1.000
			3 Both	-.03	.048	1.000
		2 Text Only	1 Pictures Only	-.02	.089	1.000
			3 Both	-.04	.079	1.000
		3 Both	1 Pictures Only	.03	.048	1.000
			2 Text Only	.04	.079	1.000

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
Q9 If you liked TWO pictures "very much" out of the three presented, how would you respond?	Games-Howell	1 Pictures Only	2 Text Only	.02	.088	.982
			3 Both	-.03	.049	.852
		2 Text Only	1 Pictures Only	-.02	.088	.982
			3 Both	-.04	.077	.847
		3 Both	1 Pictures Only	.03	.049	.852
			2 Text Only	.04	.077	.847
Q10 If you liked ALL THREE pictures "very much", how would you respond?	Tukey HSD	1 Pictures Only	2 Text Only	.06	.069	.690
			3 Both	.00	.038	.995
		2 Text Only	1 Pictures Only	-.06	.069	.690
			3 Both	-.06	.061	.588
		3 Both	1 Pictures Only	.00	.038	.995
			2 Text Only	.06	.061	.588
	Bonferroni	1 Pictures Only	2 Text Only	.06	.069	1.000
			3 Both	.00	.038	1.000
		2 Text Only	1 Pictures Only	-.06	.069	1.000
			3 Both	-.06	.061	.978
		3 Both	1 Pictures Only	.00	.038	1.000
			2 Text Only	.06	.061	.978
	Games-Howell	1 Pictures Only	2 Text Only	.06	.073	.717
			3 Both	.00	.040	.996
		2 Text Only	1 Pictures Only	-.06	.073	.717
			3 Both	-.06	.064	.618
		3 Both	1 Pictures Only	.00	.040	.996
			2 Text Only	.06	.064	.618

Dependent Variable		(I) Q6 What did you used to make your decision about your level of interest for each work area and activity?		Mean Difference (I-J)	Std. Error	Sig.
Q17A With regard to your computer skills, would you say that you are....	Tukey HSD	1 Pictures Only	2 Text Only	-.28	.123	.063
			3 Both	-.16	.068	.053
		2 Text Only	1 Pictures Only	.28	.123	.063
			3 Both	.12	.109	.514
		3 Both	1 Pictures Only	.16	.068	.053
			2 Text Only	-.12	.109	.514
	Bonferroni	1 Pictures Only	2 Text Only	-.28	.123	.073
			3 Both	-.16	.068	.061
		2 Text Only	1 Pictures Only	.28	.123	.073
			3 Both	.12	.109	.815
		3 Both	1 Pictures Only	.16	.068	.061
			2 Text Only	-.12	.109	.815
	Games-Howell	1 Pictures Only	2 Text Only	-.28	.118	.054
			3 Both	-.16(*)	.066	.045
		2 Text Only	1 Pictures Only	.28	.118	.054
			3 Both	.12	.104	.488
		3 Both	1 Pictures Only	.16(*)	.066	.045
			2 Text Only	-.12	.104	.488

* The mean difference is significant at the .05 level.

Appendix O:
Stepwise Regression Analysis

Stepwise Regression Analysis on How JOIN 1.01e Holds the Attention of Participants

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.552(a)	.305	.304	.852	.305	370.177	1	845	.000
2	.625(b)	.390	.389	.799	.086	118.328	1	844	.000
3	.635(c)	.403	.401	.791	.013	17.652	1	843	.000
4	.641(d)	.410	.407	.786	.008	10.913	1	842	.001

Note. a Predictors: (Constant), Q1D Visual Appeal Rating

b Predictors: (Constant), Q1D Visual Appeal Rating, Q5 How Did JOIN do at increasing your knowledge of Navy work areas, styles, and activities?

c Predictors: (Constant), Q1D Visual Appeal Rating, Q5 How Did JOIN do at increasing your knowledge of Navy work areas, styles, and activities?, Q1B Instructions Rating

d Predictors: (Constant), Q1D Visual Appeal Rating, Q5 How Did JOIN do at increasing your knowledge of Navy work areas, styles, and activities?, Q1B Instructions Rating, Q2 Comparison to Paper-Pencil Format

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